Supporting Documentation
for
CERCLA Closure Certification
of the
SSA Purge Water Storage Tanks

JASON ASSOCIATES CORPORATION

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EXECUTIVE SUMMARY

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) provides a process for the remediation of contaminated sites. As part of the CERCLA process, a Record of Decision identifies the applicable or relevant and appropriate requirements (ARAR) that apply to the project. This document addresses closure of the Staging and Storage Annex (SSA) Purge Water Storage Tanks at the Idaho Nuclear Technology and Engineering Center (INTEC) of the Idaho National Engineering and Environmental Laboratory (INEEL). The SSA Purge Water Storage Tanks consist of seven large (8,500 gallon capacity), above ground polyethylene tanks used to store groundwater purged from wells as part of CERCLA investigations. An ARAR identified for areas and equipment used to store CERCLA wastes that are hazardous are the hazardous waste regulations promulgated pursuant to the Resource Conservation and Recovery Act (RCRA) and the corresponding Idaho Hazardous Waste Management Act (HWMA). These regulations establish specific requirements for the closure of treatment, storage, or disposal facilities, including a requirement that closure actions be certified by an independent Professional Engineer (PE) as being performed in accordance with a closure plan. This document has been compiled in support of the PE's certification of closure for the SSA Purge Water Storage Tanks.

Operated as part of CERCLA actions, neither the SSA nor the tanks are subject to the administrative requirements (such as permitting) of HWMA/RCRA regulations, but they are subject to the substantive requirements (such as design and operational requirements to ensure protection of human health and the environment) that would be applicable to hazardous waste management facilities. The substantive requirements of HWMA/RCRA regulations extend into the manner in which waste management units such as the storage tanks are closed. To ensure the substantive requirements are met, the INEEL has chosen to develop a formal closure plan and pursue certification of an independent PE that closure actions were performed in accordance with the plan.

The *CERCLA Closure Plan for the SSA Purge Water Storage Tanks* was developed and is being implemented in accordance with a CERCLA Record of Decision and Remedial Action Work Plan that have been approved by the regulatory agencies (U.S. Environmental Protection Agency and Idaho Department of Environmental Quality) providing oversight for the INEEL CERCLA program. The regulatory agencies have also received formal notification of this closure action. The Closure Plan describes closure activities, defines closure objectives, and sets performance standards to be achieved. The primary activities specified by the plan to achieve closure objectives include the following:

- Remove the waste water from the tanks and decontaminate the tanks' interior surfaces with high-pressure water spray;

- Sample the decontamination residues remaining in the tanks and analyze the samples for the contaminants of concern identified in the Closure Plan

- Using a CERCLA risk assessment, calculate the hazards potentially associated with the contaminants in the decontamination residues to verify they represent a risk less than 10^{-4} and a hazard quotient of less than 1 for a work exposure scenario; and

- Manage closure-generated waste as CERCLA remediation waste.

The PE's certification, as supported by this document, attests to the fact that closure was accomplished in accordance with the Closure Plan, that performance standards were attained by closure activities and, therefore, that clean closure of the SSA Purge Water Storage Tanks in accordance with applicable or relevant and appropriate requirements for a hazardous waste storage unit has been achieved.

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1. UNIT DESCRIPTION AND KEY ELEMENTS OF CLOSURE

This document addresses closure of the Purge Water Storage Tanks at the Staging and Storage Annex (SSA), CPP-1789, located within the Idaho Nuclear Technology and Engineering Laboratory (INTEC) at the Idaho National Engineering and Environmental Laboratory (INEEL). It was compiled in support of an independent Professional Engineer's (PE's) certification that the closure was performed in accordance with a Closure Plan developed pursuant to a Work Plan and a Record of Decision (described further in Section 1.3) approved by the State of Idaho's Department of Environmental Quality (DEQ) and Region 10 of the U.S. Environmental Protection Agency (EPA). The approval of the environmental regulatory agencies indicate actions described in the Closure Plan are consistent with requirements set under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and with applicable or relevant and appropriate requirements (ARARs) set for hazardous waste management facilities under the Resource Conservation and Recovery Act (RCRA) and the corresponding Idaho Hazardous Waste Management Act (HWMA).

The remainder of this section describes the specific units being closed and the key elements of closure that are required by the Closure Plan. Section 2 of this document describes the field observations and record reviews performed by the independent PE and Section 3 describes results of the PE's evaluation of sample results and information collected and described in Section 2. Section 4 identifies actions observed or situations encountered during closure implementation that differ from those described in the Closure Plan (but which were judged to not affect the overall closure performance standards). The Section 5, Conclusion, summarizes the findings of the PE's effort.

1.1 UNIT DESCRIPTION

The SSA is a paved and fenced area located in the southwest portion of INTEC that is used for the temporary storage and staging of CERCLA waste generated at the INEEL. The SSA is the location for eight large, aboveground polyethylene tanks that were delivered to the INEEL in September 2000. Beginning in April 2001, seven of these tanks were used for the storage of groundwater purged from wells as part of remedial activities within Waste Area Group (WAG) 3, the INTEC area, of the INEEL. The eighth tank was identified as a reserved tank, but was never used for the storage of waste and is not included in this closure action. Each of the seven tanks addressed by this closure consists of an 8,500 gallon, closed-top, vertical storage tank sitting inside a vertical, open-top vessel (also polyethylene) with a capacity of about 9,800 gallons. The outer vessel provided secondary containment for the inner tank. The inner tanks are about 16 feet tall and 10 feet in diameter; the outer vessels are about 12 feet tall and almost 12 feet in diameter. None of the tanks are connected to external piping systems; they were filled by pumping through flexible hoses from portable containers brought to the SSA site. Both the tanks and the secondary containment vessels can be accessed only from the top, because there are no plugs or ports on the bottoms or sides.

According to Section 3 of the Closure Plan, the maximum amount of purge water contained in the seven tanks was about 45,000 gallons. This same section of the Closure Plan also identifies the contaminants of concern (COCs) for this closure action, which are based on sampling of the wastewater and shown in Table 1. The SSA Purge Water Tanks are no longer needed to support CERCLA projects because the INEEL CERLCA Disposal Facility (ICDF) evaporation pond is now available for these types of waste. The ICDF is located immediately west of the INTEC fence and was constructed in accordance with the plans and records reviewed and approved by the regulatory agencies. Further description of the wastewater storage tanks and their use can be found in *CERCLA Closure Plan for the SSA Purge Water Storage Tanks* (INEEL 2003), ICP/EXT-03-00005, Revision 0, Project No. 23488, November 2003.

It should be noted that the Closure Plan identifies two additional large storage tanks located at the SSA (for a total of ten). These two tanks are of a slightly different configuration and they arrived at the site in October 2003. However, these last two tanks were never used to store CERCLA waste and, like the reserved tank among the original set of eight tanks, are not included in this closure action.

Table 1. Contaminants of concern identified for the SSA Purge Water Tanks.

Group	Contaminant of Concern	Group	Contaminant of Concern
Metals	Aluminum Arsenic Barium Calcium Chromium Cobalt Copper Iron Lead Magnesium Manganese Mercury Nickel Potassium Sodium Zinc	Other Inorganics Organics	Chloride Fluoride Nitrate/nitrite-N Sulfate Carbon disulfide Tetrachloroethylene Toluene Methylene chloride Acetonitrile

1.2 KEY ELEMENTS OF CLOSURE

The Closure Plan for the SSA Purge Water Storage Tanks describes closure activities, defines closure objectives, and sets performance standards to be achieved. The performance standards described in the CERCLA Closure Plan are those set by the HWMA/RCRA ARARs for closure of general hazardous waste management units. The key closure actions to be accomplished in order to achieve the performance standards are summarized in the statements that follow.

- The wastewater will be removed from the tanks to the extent practicable and the inside of the tanks will be decontaminated using a high-pressure water spray. The decontamination, or washing, will begin at the top of the vessel and work down the sides, and will be performed at least twice, each with a minimum of 200 gallons of raw water. The mixed wash water and residual wastewater (remaining after the initial waste removal) will be pumped to a portable container for proper disposition.

- Decontamination residues remaining in the tanks after the two wash cycles and removal actions will be sampled and the samples will be analyzed for the COCs identified in the Closure Plan and shown in Table 1 of this document.

- A CERCLA risk assessment methodology will be used to calculate the hazards potentially associated with the contaminants in the decontamination residues to verify performance standards have been met. The performance levels set by the Closure Plan in order to achieve clean closure are a risk of less than 10^{-4} and a hazard quotient of less than 1 for a worker exposure scenario.

- All waste generated under this closure action will be managed as CERCLA remediation waste.

The Closure Plan referenced above (Document ICP-EXT-03-00005, Revision 0, November 2003) is the version of the Closure Plan used by the independent PE in evaluating closure actions for the SSA Purge Water Storage Tanks. The PE was provided a copy of the November 11, 2003 letter from the U.S. Department of Energy, Idaho Operations Office (DOE-ID) that provided this Closure Plan to the regulatory agencies (EPA and DEQ) and provided notification of the intended closure action. Unless otherwise noted, all references to the Closure Plan made in this document are to the final version, dated November 2003.

1.3 REGULATORY BASIS AND SCOPE OF CLOSURE ACTION

Further description and clarification of the regulatory basis and scope of this closure action is warranted because of its somewhat unique nature. Though this supporting document and the associated independent PE's certification were prepared in accordance with HWMA/RCRA requirements on closure actions, the SSA Purge Water Storage Tank closure action was actually performed under a different regulatory basis, specifically CERCLA. As part of CERCLA actions, neither the Annex nor the tanks are subject to the administrative requirements (such as permitting) of HWMA/RCRA regulations, but they are subject to the substantive requirements (such as design and operational requirements to ensure protection of human health and the environment) that would be applicable to hazardous waste management facilities. In CERCLA terminology, the substantive requirements of HWMA/RCRA regulations are ARARs that are to be met in the manner described in specific plans and records that have received public review and been approved by the appropriate regulatory agency. In this case, the Closure Plan specifies that the approach for meeting ARARs was identified in the WAG 3, Operable Unit (OU) 3-13 Record of Decision (DOE-ID 1999) and the *INEEL CERCLA Disposal Facility Complex Remedial Action Work Plan* (DOE-ID 2003). These documents commit to meeting the substantive requirements of specific HWMA/RCRA regulations, including those dealing with closure. To ensure the substantive requirements applicable to closure are met, INEEL has chosen to develop a formal closure plan and pursue certification of an independent PE that closure actions were performed in accordance with the plan.

2. OBSERVATIONS AND RECORD REVIEWS

The services of Keith Davis, of Jason Associates Corporation (Jason), were obtained to act as the independent Professional Engineer (PE) in observing and ultimately certifying closure of the SSA Purge Water Storage Tanks in accordance with the previously identified Closure Plan. Mr. Davis is a registered PE in the State of Idaho.

The scope of the SSA Purge Water Storage Tanks' closure deals primarily with the removal of the waste inventory followed by decontamination of the tanks and sampling and analysis of the decontamination residues to verify that no unacceptable risk remains. The independent PE was not present to witness all closure activities, but the key action of collecting the final verification samples was observed. The PE also reviewed records on the closure activities and records documenting waste management actions. The independent PE's certification effort is based on the premise that these actions (i.e., observation of key activities and review of closure activity and waste management records) represent adequate evidence of whether closure performance standards were met. Activities and documentation observed by the PE are described in this section as are pertinent facts relayed from conversations with INEEL personnel.

2.1 FIELD OBSERVATIONS

Field observations made by the independent PE are described in this section by the date they occurred.

June 8, 2004. The independent PE was present at the SSA, CPP-1789, on June 8, 2004 to observe collection of decontamination water residues from the SSA Purge Water Storage Tanks. The PE was informed that each of the seven tanks had been emptied of wastewater and decontaminated twice as described in the Closure Plan, so this sampling effort was intended to be the final verification step that performance standards were met. Upon his arrival at the site, the PE observed the tanks to be arranged in two rows along side the east fence of the SSA as shown in Figure 1. Each of the tanks was identified with a number as shown in the figure. Tank SSA #6 also had an "Empty" label and was described as the one tank out of the eight that had never been used for waste storage and which was not to be included in the sampling effort.

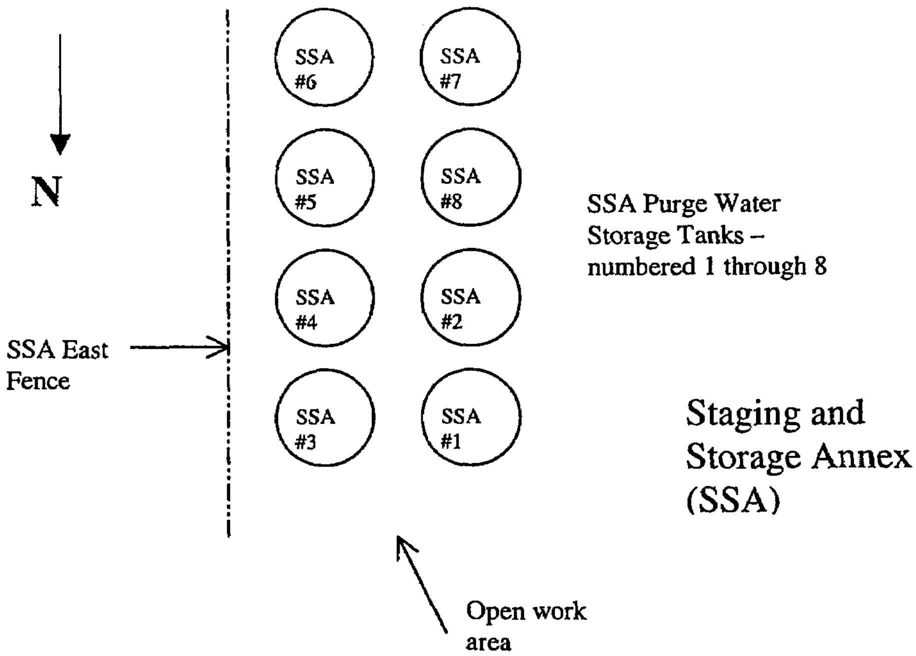

Figure 1. Layout of Purge Water Storage Tanks in the SSA

Activities on this day were limited to collection of samples for anion analysis. INEEL personnel were concerned about the short holding time for these samples and wanted to get all of the anion samples to shipment and the laboratory as soon as possible (i.e., after only a single day of sampling). The plan was to collect all the other samples on a subsequent day. Equipment present at the site to support the sampling effort included a motorized lift to put one of the sampling crew at the top of the tank being sampled and a small, portable peristaltic pump to pull the water from the bottom of the tank up over the top and down to the ground level where other sampling crew members would collect the samples. The first sample was collected from the tank designated SSA #1. The motorized lift was positioned in the open isle space on the west side of the west row of tanks. At the top of the tank, the hatch was opened and a weighted length of flexible plastic (Tygon®) tubing was lowered down into the water at the bottom of the tank. (The weight on the end of the tube was also designed to prevent the end of the tube from touching the tank bottom.) The other end of the tubing extended to the peristaltic pump sitting on the ground at the base of the tank's outer vessel. When the pump was turned on, it took a few moments for the water to reach the top of the tank, but when it did, it could be seen in the tubing moving down toward the pump. Two pre-labeled sample containers (125 ml each) were filled directly from the pump's discharge tube. The container labels were identified with the sample numbers W0990300101AM and W0990300102AM. The "AM" extension at the end of the sample numbers indicated these sample containers were designated for anion analysis.

After the sample containers were filled, the collection tube was removed from the pump and handed to the individual on the lift who drained the tube back into the tank as it was pulled out.

Sampling moved to tank SSA #2 next where the process was repeated for collection of two anion samples. The only difference noted in this sample collection was that the tubing was purged prior to the collection of the samples. Since the same length of tubing was to be used to collect the samples from this tank as was used for the first set of samples, a 30 second purge was done with water from SSA #2 to remove any residues remaining from the SSA #1 water. The purge water was directed into a small 3-gallon carboy brought to the site for the purpose of containing this excess water. The sampling process continued with samples being collected first from the four tanks on the west row (i.e., tanks SSA #1, SSA #2, SSA #8, and SSA #7 as shown in Figure 1) where there was easy access for the motorized lift. When the sampling moved to the tanks in the next row over (i.e., the east row), it was more difficult to position the lift, but it was still done from the isle on the west side of the tanks. The lift had to be positioned so that its arm could be swung and raised to reach the far row of tanks through the space between the near row. In this manner, the middle two tanks in the east row (SSA #5 and SSA#4) were sampled, then the lift was moved to the north end of the tanks to access the last tank (SSA #3).

Throughout the sampling event, sample labels on the filled sample containers were observed being marked with the time of sample collection then fixed with clear tape. The sample containers were then logged and placed in coolers with Blue Ice. The sample numbers and the corresponding tanks from which they were collected are summarized in Table 2.

June 9, 2004. The independent PE was again present at the SSA site to observe the second round of sample collection from the SSA Purge Water Storage Tanks. The objective for this day was to collect samples from each of the seven tanks for analysis of all parameters other than anions (collected on the previous day). Sampling methods were the same as described for the June 8, 2004 action, except that there were two sampling crews working on this day. Both crews were utilizing flexible tubing and a peristaltic pump to collect the samples, the only difference in operation between the two was that one group used the motorized power lift to access the top of the tanks and the other used a moveable stairway structure. The second sampling crew used new tubing at the first tank they sampled, so no purge of the tubing was done on their first sample, but a 30 second purge was included when they performed sample collection on a subsequent tank. The PE observed sample collection from each of the seven tanks, which included the filling of many more sample containers than for the first round. Again, all sample containers

Table 3. Summary of samples collected and analyses performed as part of closure actions.

Sample Number	Description/Tank Sampled	Sample Date	Analyses to be Performed [a] AM	LM	V6	VZ
W0990300101	Decontamination water from tank SSA #1	6/8/04 6/9/04	X	X	X	X
W0990300102	Decontamination water from tank SSA #1	6/8/04 6/9/04	X	X	X	X
W0990300201	Decontamination water from tank SSA #2	6/8/04 6/9/04	X	X	X	X
W0990300202	Decontamination water from tank SSA #2	6/8/04 6/9/04	X	X	X	X
W0990300301	Decontamination water from tank SSA #3	6/8/04 6/9/04	X	X	X	X
W0990300302	Decontamination water from tank SSA #3	6/8/04 6/9/04	X	X	X	X
W0990300401	Decontamination water from tank SSA #4	6/8/04 6/9/04	X	X	X	X
W0990300402	Decontamination water from tank SSA #4	6/8/04 6/9/04	X	X	X	X
W0990300501	Decontamination water from tank SSA #5	6/8/04 6/9/04	X	X	X	X
W0990300502	Decontamination water from tank SSA #5	6/8/04 6/9/04	X	X	X	X
W0990300601	Decontamination water from tank SSA #7	6/8/04 6/9/04	X	X	X	X
W0990300602	Decontamination water from tank SSA #7	6/8/04 6/9/04	X	X	X	X
W0990300701	Decontamination water from tank SSA #8	6/8/04 6/9/04	X	X	X	X
W0990300702	Decontamination water from tank SSA #8	6/8/04 6/9/04	X	X	X	X

a. The analysis codes shown are those used on the various sample containers following the sample number shown. Analyses/analytes represented by the codes are as follows:
AM - Anions
LM - Total Metals [TCLP target analyte list (TAL)]
V6 - Underlying Hazardous Constituent (UHC) Volatile Organic Compounds (VOCs)
VZ - UHC Semi-Volatile Organic Compounds (SVOCs)

were pre-labeled and marked with the collection time as they were filled and were moved quickly into coolers with Blue Ice as they were taped and logged.

Samples collected during the June 9, 2004 sampling event are also shown in Table 2 along with the analyses to be performed. The two character extensions shown on the right side heading of the table are the ones that were observed on the sample container labels as part of the sample number and which are defined in the table's footnote. It should be noted that there were nine other sample extensions (and sample containers) involved in the tank sampling that are not shown in Table 1. These other extensions were all for radiological parameters, which are not considered part of this closure action because they are not covered by the HWMA/RCRA regulations driving the action.

2.2 RECORD REVIEWS AND CONVERSATIONS

The independent PE was provided copies of several documents, in addition to the Closure Plan, which provided detailed descriptions of specific closure activities or verification that specific closure activities were performed. The PE was also able to obtain additional information, as needed, by asking questions of the INEEL personnel involved in the closure actions. The following discussions are grouped by the type of records reviewed. When information in the records was augmented through conversation or correspondence with INEEL personnel, that information is included in the discussion.

2.2.1 Records of Tank Decontamination

The PE did not witness the tank decontamination actions, but did request copies of the operations log that was completed when the decontamination, or washing action was performed. The PE was provided a copy of the field log notes taken by the Waste Generator Services (WGS) Waste Technical Specialist (WTS) involved in operations of the SSA. The log entries covered June 1, 2, and 3, 2004, when the seven SSA tanks were washed. The notes describe a water truck being loaded with 4,000 gallons of water from the INTEC fire protection line. At the first tank (SSA #3) washed, the surface of the water remaining in the tank was measured at 15.7 feet from the top of the tank before any washing was done. (The water level was measured with an E-Line Water Level Indicator consisting of a probe and attached line wrapped around a spool, mounted on top of the movable stairway.) The hose from the water truck was used to wash the interior of this tank for 5 minutes. The water level in the tank was measured again at 15.45 feet. Since the tank contains 49 gallons per inch and the water increased by 0.25 feet, or 3 inches, it was determined that the water truck was delivering 147 gallons per five minutes, or 29.4 gallons per minute (gpm). Based on this information, it was calculated that it would take 6.8 minutes to perform a 200-gallon wash (as required by the Closure Plan). To be conservative, the decision was made to wash each tank for at least 8 minutes.

Table 4 summarizes the tank washing information contained in the field log for the first cycle of tanks washings, which were performed on June 1, 2004. As noted in the table, when the washing was complete and the wash water was pumped out of the tanks, it was determined that approximately 350 gallons of water had been added to each of the tanks. (Apparently, one or more of the values used in the initial calculations was slightly off.) Before performing the second set of washes, the amount of water being delivered by the water truck was reevaluated. Based on what was observed from the first wash, the truck's pump was delivering 43.75 gpm (i.e., 350 gallons divided by 8 minutes) while the motor was running at 1,400 revolutions per minute (rpm). Therefore, 200 gallons could be delivered in about 4.6 minutes. At this point the decision was made to perform the second set of tank washes by running the hose in each tank for 5 minutes with the motor speed increased to 1,600 rpm to provide some additional conservatism. There was no mention in the log of any additional verification or estimate of how much water was actually delivered to each tank during the second washing. The tank washing information contained in the field log for the second cycle of tank washings, performed on June 2, 2004, is also summarized in Table 4.

Table 4. Summary of decontamination washes performed on SSA Purge Water Storage Tanks.

First Wash (in order performed)				Second Wash (in order performed)			
Tank	**Date**	**Time Washed**	**Volume**	**Tank**	**Date**	**Time Washed**	**Volume**
SSA #3	6/1/04	5 min (1335 to 1340 hrs) 3 min (1400 to 1403 hrs)	350 gallons [a]	SSA #4	6/2/04	7 min (1328 to 1335 hrs)	219+ gallons [b]
SSA #4	6/1/04	8 min (1408 to 1416 hrs)	350 gallons [a]	SSA #8	6/2/04	5 min (1356 to 1401 hrs)	219+ gallons [b]
SSA #1	6/1/04	8 min (1429 to 1437 hrs)	350 gallons [a]	SSA #2	6/2/04	5 min (1418 to 1423 hrs)	219+ gallons [b]
SSA #2	6/1/04	8 min (1441 to 1449 hrs)	350 gallons [a]	SSA #1	6/2/04	5 min (1426 to 1431 hrs)	219+ gallons [b]
SSA #8	6/1/04	8 min (1458 to 1506 hrs)	350 gallons [a]	SSA #3	6/2/04	5 min (1515 to 1520 hrs)	219+ gallons [b]
SSA #5	6/1/04	8 min (1517 to 1525 hrs)	350 gallons [a]	SSA #5	6/2/04	5 min (1525 to 1530 hrs)	219+ gallons [b]
SSA #7	6/1/04	8 min (1531 to 1539 hrs)	350 gallons [a]	SSA #7	6/2/04	5 min (1532 to 1537 hrs)	219+ gallons [b]

a. The volume shown for the first wash cycle is based on the amount of water removed from the tanks after the first wash was complete (and before the second wash was performed).

b. The volume shown for the second wash cycle is based on the calculation that the washing equipment discharged 43.75 gallons per minute during the first wash when the truck was running at 1,400 rpm. This would mean that running for 5 minutes, the equipment would discharge about 219 gallons. However, the second wash was performed at the truck running at 1,600 rpm to add an element of conservatism.

The field log entries described the removal of the decontamination solutions after both of the washing cycles. The water from the first wash cycle was pumped out of the tanks on the morning of June 2, 2004 (before the second cycle was started). Removal of water from the second wash cycle was started concurrently with the washing (i.e., water from tanks already washed were removed while washing was underway on subsequent tanks) and finished during the morning of June 3, 2004. The log indicated that removal of water from the second wash included pumping the water down to within a couple of inches from the bottom (to allow for sampling). The log entries also indicate all of the wash water was sent to the ICDF for placement in the evaporation pond.

During the sampling event described in Section 2.1, the PE was able to ask an equipment operator about the tank washing actions. This operator was identified as the individual who had manned the water hose during the tank decontamination. When asked about the effectiveness of the action, this individual indicated he was confident that the method used had allowed a good wash of the tanks. That is, he could get the hose directed at all of the interior surfaces.

2.2.2 Sample Records

The independent PE was provided several different documents dealing with the planning and performance of the sampling actions required by this closure action and the evaluation of the analytical data that resulted from analysis of the samples. These sample-related records are described in the following sections.

2.2.2.1 Sampling and Analysis Plan

The PE requested and received a copy of the sampling and analysis plan (SAP - INEEL 2004a) under which sampling of the tank residuals was performed. This SAP describes the sampling project and its objectives as well as the roles and responsibilities of the INEEL personnel involved in the action. It also works through the data quality objectives (DQOs) and describes the sample collection procedures, analysis methods, and data management protocols. In general, sampling activities described in the plan were consistent with the field observations made by the PE when the sampling was performed. It was noted during review of the SAP that the sampling and analysis table in the SAP (SAP Table 4-1) does not identify the collection of samples for the analysis of anions. However, the Sampling and Analysis Plan Table included as Appendix A to the SAP does include this analysis for each sample. This is considered a minor discrepancy in the SAP and since sample collection and analyses included anions, there was no affect on the Closure Plan implementation.

2.2.2.2 Sample Logbook

The independent PE was provided a complete copy of the Sample Logbook (INEEL 2004b) filled out during the closure sampling activities. The copy reviewed was signed and dated by a member of the sampling crew and by an individual that performed a QA check of the entries. This document was requested by the PE primarily because he had not witnessed collection of the rinse water blank described in the SAP. Based on the logbook entries, the rinse water blank was collected on June 2, 2004, the week before the tank residuals were sampled. The blank was collected on the same day the second decontamination cycle was performed on the tanks (see Section 2.2.1) and was collected from a spigot on the water truck that provided water for the decontamination actions. Because of the manner in which this blank sample was collected, it not only represents the raw water source used in the decontamination (and subsequently sampled as tank residuals), but it also should provide a representation of any contaminants that may have been introduced into the system by the water truck tank. Accordingly, this document refers to this sample as an equipment blank or baseline sample for potential identification of contaminants not inherent in the tank residuals, but introduced into tanks by the raw water or by the water truck. It must be recognized, however, that other potential sources of contaminants, particular the water truck's delivery hose and the sample collection tubing, are not represented in this baseline sample.

2.2.2.3 Sample Data Evaluation

Each data package delivered by the analytical laboratory under went a validation effort, resulting in Limitations and Validation (L&V) Reports, which present the laboratory's analytical data along with any precautions or limitations associated with the data. The L&V efforts were performed for the INEEL under subcontract to outside organizations (i.e., outside of the INEEL). The precautions and limitations were assigned in accordance with well-defined procedures and presented in the form of data validation flags that, as appropriate, accompany the individual analytical results. The PE was provided copies of these reports and utilized them in his evaluation of the analytical data. Accordingly, applicable L&V Reports are referenced individually in Section 3.1 of this document rather than being identified individually in this section.

2.2.3 Action Level Development Documentation

The Closure Plan does not set action levels for contaminants in the tank residues, rather it requires that the combined risk represented by any contaminants in the residues pose less than 10^{-4} cumulative carcinogenic risk and have a total hazard quotient threshold of less than 1 when evaluated under a potential worker exposure scenario. The INEEL made the decision to develop action levels for the COCs that would ensure the risk criteria were met. The action level development methodology and results were documented in a report (INEEL 2004c) that was provided to the independent PE for review. The methodology used was basically to distribute the allowable risk amongst the COCs so that each constituent was given a risk (or hazard quotient) target with the total still meeting the Closure Plan criteria. (For example, if there were 20 COCs and the allowable risk was divided evenly, then each COC would be given a target of 5% of the allowable total risk.) Back calculations were then performed using standard risk assessment methodology for a future occupational receptor to determine the concentration for each COC in the tank residues that would generate its target risk value. Depending on the nature of the constituent's toxicity, individual calculations were performed for both carcinogenic and non-carcinogenic health risks, and for both ingestion and inhalation exposure scenarios. Then the lowest back calculated concentration from among these variables was set as the COC's action level. This approach should be conservative because if all COCs are at their action levels then the Closure Plan criteria is met, but it is more likely that if all are below their actions levels, then some of them will be well below their action levels. As an additional measure of conservatism, the total allowable cancer risk used in the action level development methodology (INEEL 2004c) is 10^{-6} rather than the 10^{-4} set by the Closure Plan.

The INEEL's methodology for developing action levels relies on toxicity information taken from EPA Region 9 Preliminary Remediation Goals (PRGs) 2002 Table (EPA 2004a). There was apparently no attempt to determine if other recognized sources of toxicity information contained more recent data. If the PRG table did not contain toxicity information for a specific COC, then it was assumed that the COC had no recognized toxicity and no action level could be calculated. Action levels were developed for 18 of the 25 COCs identified in Table 1. The specific action levels are presented in Section 3.1 of this document in discussions of the tank residue sampling results.

2.2.4 Waste Management Records

The independent PE was informed by electronic correspondence that the waste debris generated during closure was managed under waste material profile 4289Q and the groundwater that had been stored in the SSA tanks, as well as the rinse water from their decontamination, was managed under waste material profile 3009N. The PE subsequently requested and was provided copies of the Waste Determination & Disposition Forms (WDDFs) for these two waste material profiles. In both cases, the profiles were generated for the on-going generation of waste streams from specific INEEL CERCLA activities, namely the activities that generated the purge water stored in the tanks undergoing closure. Key information from the WDDFs, which were signed and dated versions of the documents, is summarized in Table 5.

Table 5. Summary of information contained in WDDFs applicable to closure-generated waste.

Element	Description in Waste Determination & Disposition Form (WDDF)
Profile Number	3009N
Profile Name	WAG 3 Group 4 and 5 Purge Water
Waste Description	Purge water, development water, and sampling water from Group 4 and 5 (perched water and Snake River Plain Aquifer water, respectively) CERCLA activities for WAG 3. Water carries F and U codes and is radiologically contaminated due to contamination from INTEC activities.
Determination	a) Hazardous waste, carrying Hazardous Waste Numbers F001, F002, F005, and U134 b) Does not exhibit any hazardous characteristics c) Mixed waste – radiological contamination may be present
Proposed Disposition	ICDF evaporation pond
Signature Date	October 6, 2003
Profile Number	4289Q
Profile Name	Debris from the sampling of INEEL water
Waste Description	Waste generated as a result of well sampling from WAG 3 and WAG 2. Waste stream includes PPE, wipes, nitrile gloves, filters, plastic etc. (The associated waste profile for the WAG 3 water is 3009N.) It is anticipated that the debris will be contaminated with about 1% of the contaminants from the associated water profiles.
Determination	a) Hazardous waste, carrying Hazardous Waste Numbers F001, F002, F005, and U134 b) Does not exhibit any hazardous characteristic c) Mixed waste – radiological contamination may be present
Proposed Disposition	Direct disposal at the ICDF landfill
Signature Date	April 14 and 22, 2004

3. EVALUATION OF SAMPLE RESULTS, FIELD OBSERVATIONS, AND RECORD REVIEWS

This section discusses the independent PE's review and evaluation of sampling and analysis results, observations made, and records reviewed as part of the certification effort for closure of the SSA Purge Water Storage Tanks.

3.1 RESULTS FROM SAMPLING ACTIVITIES

According to Section 4.1 of the Closure Plan, the SSA Purge Water Storage Tanks achieve clean closure if, after decontamination, samples of the residuals remaining in the tanks are shown, through a CERCLA risk assessment, to pose an exposure risk of less than 10^{-4} and hazard quotient of less than 1. The manner in which the risk assessment was performed, as described in Section 2.2.3 of this document, was to develop hypothetical COC concentrations for the tank residuals that would case the cumulative risk to reach or approach these maximum criteria (though the cancer risk limit actually used in the calculations was 10^{-6} rather than 10^{-4}). The hypothetical concentrations can, therefore, be considered action levels and if all sample results fall below the action levels, then the Closure Plan's criteria for clean closure of the decontaminated tanks are met.

Analytical results from decontamination solution, or tank residual samples collected from the SSA Purge Water Storage Tanks are summarized in Tables 6, 7, and 8. The results are presented in multiple tables simply because of the amount of data and so that all data for any single tank can be presented in one table. Table 6 contains the analytical results for tanks SSA #1, SSA #2, and SSA #3; Table 7 contains the analytical results for tanks SSA #4, SSA #5, and SSA #7 (SSA #6 is the tank that was never used for waste storage); and Table 8 contains the analytical results for tank SSA #8. Also shown in each table are the action levels established as described above and the results from the baseline sample. The baseline is used to identify COCs that may have been introduced into the tank residuals with the raw water used during decontamination or through contact with water truck components. The table shows results only for those constituents identified as COCs in the Closure Plan. Several of the analytical methods performed include a longer list of analytes and results for other constituents (not shown in the tables) are discussed in general terms along with the COC results. The table also presents qualifier flags as applied by the laboratory and/or data validation efforts, and which are defined in table footnotes. The results of the data validation efforts were reported in the form of Limitations and Validation (L&V) Reports, which were provided to the

Table 6. Summary of analytical results for COCs in samples from Tanks SSA #1, #2, and #3.

Constituents of Concern	Analytical Results by Sample Location and Number (in $\mu g/L$)							Action Levels ($\mu g/L$)
	Baseline	Tank SSA #1		Tank SSA #2		Tank SSA #3		
	W0990300801	W0990300101	W0990300102	W0990300201	W0990300202	W0990300301	W0990300302	
Metals								
Aluminum	14.7 UJ	6,000 J	1,190 J	19.5 J	17 J	14.7 UJ	14.7 UJ	344,000
Arsenic	2.24 U	7.3	7.6	3	2.24 U	13.6	15.4	2,860
Barium	74.6	124	96.1	36.4	35.6	81.6	81.5	59,300
Calcium	41,700	47,600	41,400	16,500	16,100	47,100	47,600	None [a]
Chromium	3.6	4.9	1	1.6	1.2	0.503 U	0.503 U	2,810
Cobalt	0.541 U	2.5	0.541 U	0.541 U	0.71	1.1	0.68	39,300
Copper	1.39 U	12	5.4	12.5	9.5	1.39 U	1.39 U	344,000
Iron	5,040	5,500	1,230	152	153	462	462	344,000
Lead	1.72 U	1.72 U	1.72 U	1.72 U	1.72 U	1.72 U	1.72 U	250
Magnesium	13,700	28,800	25,300	8,930	8,720	14,300	14,400	None [a]
Manganese	105	214	130	16.8	16.1	42.6	42.9	344,000
Mercury	0.0472 U	0.0472 U	0.061	0.096	0.071	0.067	0.051	120
Nickel	2.1	17.1	9.1	2.7	2.9	10.2	9.3	344,000
Potassium	2,290	5,070	4,550	2,060	2,000	2,580	2,600	None [a]
Sodium	7,580	29,400	27,200	7,860	7,670	9,350	9,400	None [a]
Zinc	3.7	19.6	5.8	10.5	7.5	5.3	4.8	344,000
VOCs								
Acetonitrile	25.0 R	25.0 R	25.0 R	25.0 R	25.0 R	25.0 R	25.0 R	344,000
Carbon disulfide	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	344,000
Methylene chloride	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	4,570
Tetrachloroethylene	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	420
Toluene	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	287,000
Anions								
Chloride	14,300 J	27,400 J	28,000 J	14,700 J	14,700 J	17,900 J	17,900 J	None [a]
Fluoride	235 J	204 J	203 J	168 J	164 J	171 J	180 J	344,000
Nitrate-N	726 J	500 UJ	500 UJ	500 UJ	500 UJ	500 UJ	500 UJ	None [a]
Nitrite-N	68 J	500 U	500 U	500 U	500 U	500 U	500 U	None [a]
Sulfate	23,500 J	7,230 J	7,270 J	22,300 J	22,300 J	31,300 J	31,300 J	None [a]

☐ Shaded entries are those with questionable qualifications and which are discussed in the text.

J The compound was positively identified in the sample, but the associated numerical value may not be accurate and should be considered an estimated quantity.

U The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit or, in the case of metals, the method detection limit.

UJ The material was analyzed for but was not detected. The sample quantitation or detection limit shown is an estimated quantity.

R The data are rejected and should be considered unusable (may or may not be present).

a. No toxicity was identified for these COCs, so no action levels were calculated.

Table 7. Summary of analytical results for COCs in samples from Tanks SSA #4, #5, and #7.

Constituents of Concern	Analytical Results by Sample Location and Number (in $\mu g/L$)							Action Levels ($\mu g/L$)
	Baseline	Tank SSA #4		Tank SSA #5		Tank SSA #7		
	W0990300801	W0990300401	W0990300402	W0990300501	W0990300502	W0990300601	W0990300602	
Metals								
Aluminum	14.7 UJ	77.9 J	78.2 J	629 J	197 J	1,000 J	749 J	344,000
Arsenic	2.24 U	2.24 U	2.6	5.4	6.3	8.1	8.6	2,860
Barium	74.6	58.6	59.1	61.4	57.2	72.8	72.3	59,300
Calcium	41,700	17,200	17,400	27,700	26,500	35,200	35,600	None [a]
Chromium	3.6	1.1	1.8	0.98	0.503 U	0.84	1.7	2,810
Cobalt	0.541 U	0.541 U	0.541 U	0.75	0.541 U	1.1	0.541 U	39,300
Copper	1.39 U	10.9	11.2	3.7	3	5.9	6.4	344,000
Iron	5,040	171	162	549	135	785	503	344,000
Lead	1.72 U	1.72 U	1.72 U	1.72 U	1.72 U	1.72 U	1.8	250
Magnesium	13,700	11,500	11,600	19,700	19,000	13,700	13,900	None [a]
Manganese	105	6.7	6.5	62.5	54.1	290	239	344,000
Mercury	0.0472 U	0.062	0.048	0.0472 U	0.055	0.0472 U	0.0472 U	120
Nickel	2.1	4.9	5.7	4	4.2	8.6	6.9	344,000
Potassium	2,290	2,820	2,870	4,200	4,110	3,650	3,770	None [a]
Sodium	7,580	9,030	9,240	22,600	22,200	14,800	15,500	None [a]
Zinc	3.7	7.6	6.5	6.4	4.1	9.1	6.5	344,000
VOCs								
Acetonitrile	25.0 R	25.0 R	25.0 R	25.0 R	25.0 R	25.0 R	25.0 R	344,000
Carbon disulfide	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	344,000
Methylene chloride	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	4,570
Tetrachloroethylene	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	420
Toluene	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	287,000
Anions								
Chloride	14,300 J	16,000 J	16,100 J	19,500 J	19,800 J	18,700 J	18,700 J	None [a]
Fluoride	235 J	134 J	123 J	214 J	184 J	312 J	354 J	344,000
Nitrate-N	726 J	500 UJ	500 UJ	500 UJ	500 UJ	500 UJ	500 UJ	None [a]
Nitrite-N	68 J	500 U	500 U	500 U	500 U	500 U	500 U	
Sulfate	23,500 J	15,300 J	15,400 J	4,410 J	4,430 J	30,900 J	31,000 J	None [a]

Shaded entries are those where with questionable qualifications and which are discussed in the text.

J The compound was positively identified in the sample, but the associated numerical value may not be accurate and should be considered an estimated quantity.

U The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit or, in the case of metals, the method detection limit.

UJ The material was analyzed for but was not detected. The sample quantitation or detection limit shown is an estimated quantity.

R The data are rejected and should be considered unusable (may or may not be present).

a. No toxicity was identified for these COCs, so no action levels were calculated.

Table 8. Summary of analytical results for COCs in samples from Tank SSA #8.

Constituents of Concern	Analytical Results by Sample Location and Number (in µg/L)			Action Levels (µg/L)
	Baseline	Tank SSA #8		
	W0990300801	W0990300701	W0990300702	
Metals				
Aluminum	14.7 UJ	14.7 UJ	14.7 UJ	344,000
Arsenic	2.24 U	6.6	2.8	2,860
Barium	74.6	35.3	33.5	59,300
Calcium	41,700	21,000	19,800	None [a]
Chromium	3.6	1.5	1.2	2,810
Cobalt	0.541 U	0.62	0.541 U	39,300
Copper	1.39 U	22.9	21.5	344,000
Iron	5,040	81.4	53.1	344,000
Lead	1.72 U	1.72 U	1.72 U	250
Magnesium	13,700	8,390	7,890	None [a]
Manganese	105	5.2	4.3	344,000
Mercury	0.0472 U	0.063	0.079	120
Nickel	2.1	6	5.8	344,000
Potassium	2,290	2,250	2,120	None [a]
Sodium	7,580	7,710	7,280	None [a]
Zinc	3.7	7.5	8.2	344,000
VOCs				
Acetonitrile	25.0 R	25.0 R	25.0 R	344,000
Carbon disulfide	5.0 UJ	5.0 U	5.0 U	344,000
Methylene chloride	5.0 UJ	5.0 U	5.0 U	4,570
Tetrachloroethylene	1.0 UJ	1.0 U	1.0 U	420
Toluene	1.0 UJ	1.0 U	1.0 U	287,000
Anions				
Chloride	14,300 J	15,100 J	15,100 J	None [a]
Fluoride	235 J	171 J	178 J	344,000
Nitrate-N	726 J	500 UJ	500 UJ	None [a]
Nitrite-N	68 J	500 U	500 U	None [a]
Sulfate	23,500 J	25,400 J	25,300 J	None [a]

Shaded entries are those with questionable qualifications and which are discussed in the text.

J The compound was positively identified in the sample, but the associated numerical value may not be accurate and should be considered an estimated quantity.

U The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit or, in the case of metals, the method detection limit.

UJ The material was analyzed for but was not detected. The sample quantitation or detection limit shown is an estimated quantity.

R The data are rejected and should be considered unusable (may or may not be present).

a. No toxicity was identified for these COCs, so no action levels were calculated.

independent PE and are referenced in the discussions of analytical results. All results with values of concern (high) or with questionable or notable qualifications are shown as shaded entries in the tables and are specifically addressed in the following discussions of the analytical results. The discussions are presented in terms (and order) of the constituent groupings shown in the tables.

3.1.1 Metals in the SSA Purge Water Storage Tanks

This section (and those that follow) addresses the analytical results in Tables 6, 7, and 8. All three of the tables are addressed together because results from each analytical method are covered by a single L&V report. Also, issues identified in these reports often apply to all of the samples results addressed.

The L&V Report (EVAC 2004a) covering the analyses of metals in the decontamination water samples from the SSA tanks indicated the analyses were performed in accordance with SW-846 methods 7470 (for mercury) and 6010B (for other metals) and assigned only limited qualifiers to the results. The only qualifications added to any of the metal COCs shown in Tables 6, 7, and 8 were "J" flags to positive detections of aluminum, and "UJ" flags to the "not detected" results for aluminum. The "J" flag indicates the constituent was positively identified, but that the reported value should be considered an estimate and the "UJ" flag indicates the material was analyzed for and was not detected, but the detection limit reported should be considered an estimated quantity. The other flags shown with the metal results in the tables are all "Us" and were assigned by the laboratory to indicate the constituent was not detected. The qualifications assigned to the aluminum results are discussed further in the paragraph that follows:

- *Aluminum.* The laboratory's aluminum results were qualified (either "J" or "UJ" flagged) by the L&V effort because the laboratory's serial dilution (i.e., one of the samples run at a dilution) result for aluminum was too different from the result of the undiluted sample. Specifically, the reported percent difference (i.e. %D) between the original and diluted sample results was reported at 10.5%. The criteria used by the L&V effort is that data associated with serial dilution %D values of 10% or less warrant no qualifications, while data associated with %D values between 10 and 40% are qualified as estimated values. Considering that "J" and "UJ" flagged data are commonly used in environmental evaluations and the reported difference for the serial dilution results were only slightly out of the acceptable range, the aluminum results are felt to be acceptable for use in determining whether closure performance standards have been achieved. In addition, the highest value reported for aluminum at 6,000 μg/L is still almost two orders of magnitude below the corresponding action level of 344,000 μg/L.

It can be concluded from the metals results shown in Tables 6, 7, and 8, that none of the metal COCs detected in the tank residuals exceeded, or even approached the corresponding action levels. In many cases similar concentrations of the metals were reported in the baseline sample. It should be noted that metal analyses provided results for 23 different analytes compared to the 16 identified as COCs. Of the seven non-COC metals, only vanadium was detected in any of the tank samples; it was detected in 8 of the 14 samples, with the maximum concentration reported at 14.4 $\mu g/L$. There were no positive detections of the other non-COC metals (specifically, antimony, beryllium, cadmium, selenium, silver, and thallium) in any of the samples. The laboratory reported small detections of several of these non-COC metals, but the L&V effort qualified them as "not detected" because they were reported at concentrations less than five times (5x) that reported in a laboratory blank.

3.1.2 VOCs in the SSA Purge Water Storage Tanks

The L&V Report (EVAC 2004b) covering the analyses of VOCs in the samples of tank residuals indicated the analyses were performed in accordance with SW-846 method 8260B and assigned several qualifiers to the results. The most significant qualification was the rejection of several VOC results (i.e., "R" flags were assigned) because the laboratory reported poorer than expected results during equipment calibration runs. Results for seven different analytes were "R" flagged for this same problem and among them was the COC acetonitrile (as shown by the shaded entries in Tables 6, 7 and 8), which is discussed in detail later in this section. The L&V effort assigned "U" flags (for not detected) to two toluene results, which were reported by the laboratory as detections. This action is discussed briefly below. Finally, the L&V effort assigned "J" flags to all of the VOC results for the baseline sample (W0990300801) because holding times were exceeded by the time the sample was analyzed. This issue and the others identified by the L&V effort are discussed in more detail in the paragraphs (identified by topic) that follow.

- *Acetonitrile.* The laboratory reported 25.0 $\mu g/L$ with the "U" flag (i.e., not detected) as the result for acetonitrile in each of the baseline and tank residual samples. The L&V Report (EVAC 2004b) assigned "R" flags to these results (as shown in Tables 6, 7, and 8) because of low Relative Response Factors (RRFs) reported for this constituent during the laboratory's initial calibration (ICAL) and continuing calibration (CCAL). The average RRF reported for acetonitrile was 0.04884 during the ICAL when standards were run at seven different concentrations and the RRF reported during the CCAL, when only a single standard was run, was 0.04552. These were evaluated for L&V purposes against a minimum RRF performance of 0.05. The laboratory's data package does not appear to include any control sample spike and recovery data for acetonitrile, so there is no other evidence on how it may have performed in the samples. Another means of evaluating whether or not the original "non-detect" can be accepted deals with the RRF values themselves. Though the reported RRF values for acetonitrile were low as noted in the L&V report, they were consistent. The ICAL information in the data package shows RRF values reported at seven different concentrations for each of the analytes covered by the method. Ideally the RRF should be the same at each concentration and a gauge of the performance in this regard is the percent relative standard deviation (%RSD) calculated from the series of RRF values reported for each analyte. (The RSD is the standard deviation of the series divided by the mean, so if the RRF is identical at each concentration, the RSD is zero.) The L&V procedures require that data be qualified if the %RSD value exceeds 15%. The reported %RSD for acetonitrile during the ICAL was 5.8%, well within the acceptable range. During CCAL a RRF is measured at a single concentration (for each analyte) and compared to the mean of the RRF value during ICAL to determine if the equipment is still in calibration. In this case, a gauge of the performance is the percent difference (%D) between the two. The L&V effort requires that data be qualified if the reported %D is greater than 20%. The reported %D for acetonitrile during the CCAL was 6.8%, again, well within the acceptable range. According to Method 8000B (EPA 1986), if %RSD values are 20% or less, it is reasonable to assume the calibration curve is linear, that it passes through the origin, and the average RRF can be used in calculating sample concentrations.

In this case, we have what should be a good, linear calibration curve based on low, but consistent RRF values. Under these conditions, the mean RRF is used in the calculation of reported concentrations so that the reported values are adjusted for the low RRFs. It's true that the low RRF allows less of a margin for error in terms of what the equipment can detect or in terms of how differently the analyte might purge from the specific sample. (That is, a drop in the equipment's efficiency or in the percent of analyte that purges from the sample could drop it out of the detectable range.) However, there is nothing in the data package or shown by the sample that would indicate there may have been such fluctuations in these areas. The equipment provided a steady response at each of the ICAL concentrations, which were all much lower than the action level of 344,000 μg/L for acetonitrile. The samples were little more than water, so the analyte in this case (acetonitrile), had it been present, should have responded or purged similarly to the way it did during the ICAL and CCAL. Considering these factors, it is the independent PE's opinion that had this COC been present in the tank residual samples, it would have been detected. Accordingly, it is believed the "not detected" results originally reported by the analytical laboratory can be used for purposes of the Closure Plan as evidence that acetonitrile was not present in the final decontamination solution water samples. This is in spite of the fact that the

L&V effort assigned a "rejected" qualifier to the laboratory results.

- *Toluene*. The L&V effort changed the laboratory's reported results for toluene in two samples from small values (0.41 and 0.98 $\mu g/L$) to a "U" flagged value of 1.0 $\mu g/L$, indicating the results should be considered as "not detected." The two results (for samples W0990300101 and W0990300801), as reported by the laboratory, were accompanied by "J" flags as estimated values being detected above the method detection limit (MDL), but below the reported quantitation limit (RQL). The L&V effort applied the "U" flag to these results because toluene was detected at 0.39 $\mu g/L$ in a laboratory blank and, per the data validation procedures, any results less than five times this amount (i.e., less than 1.95$\mu g/L$) would have been "U" flagged. This action is consistent with other recognized guidelines. According to EPA's *Functional Guidelines for Organic Data Review* (EPA 1999) developed under the CERCLA program, "Positive sample results should be reported unless the concentration of the compound in the sample is less than or equal to 10 times (10x) the amount in any blank for common volatile laboratory contaminants (methylene chloride, acetone, 2-butanone, and cyclohexane), or 5 times (5x) the amount for other volatile target compounds." It can be concluded that the reported results for toluene are not a concern with respect to meeting the Closure Plan's performance standard.

- *Holding Time*. The baseline sample (W0990300801) was collected a week earlier than the tank residual samples, but was analyzed at the same time. This resulted in the one sample being analyzed 21 days after it was collected, compared to a holding time of 14 days. Because of the exceeded holding time, the L&V effort assigned "UJ" flags to all of the results reported as "not detected" by the laboratory and "J" flags to all of the positive detections. The application of these flags to indicate estimated RQLs or estimated values is consistent with EPA's *Functional Guidelines* (EPA 1999). It is not uncommon to use "J" flagged data in environmental evaluations plus use of the baseline sample, in this case, is limited, so no further discussion on this issue is warranted.

It can be concluded from the VOC results shown in Tables 6, 7, and 8, that none of the VOC COCs were detected in the tank residuals and the corresponding action levels were met. It should be noted that VOC analyses provided results for 56 different analytes compared to the five identified as COCs. The only VOCs detected in any of the samples (excluding the two toluene detections discussed previously) were acetone and benzene. Acetone was detected in every sample at values ranging from 7.4 to 127 $\mu g/L$.

The fact that acetone is a common laboratory contaminant and that it was detected at 45 $\mu g/L$ in the baseline sample makes its actual occurrence in the tank residual samples unlikely. Benzene was detected in only three of the 14 tank samples and was reported at values ranging from 0.40 to 0.74 $\mu g/L$. In each case, the values reported by the laboratory were accompanied by a "J" flag as being an estimated value above the MDL, but below the RQL. The three benzene detections were all from different tanks; that is, it was not detected in the second sample from the same tank. Based on the low reported concentrations and the fact that its presence was not confirmed in the second sample from the same tank, it is believed benzene should not be considered an issue for this closure action.

3.1.3 SVOCs in the SSA Purge Water Storage Tanks

There are no SVOCs identified as COCs in the Closure Plan and none are shown on Tables 6, 7, and 8. However, to be conservative, the INEEL had samples of the tank residues analyzed in accordance with SW-846 method 8270C for a fairly large list of SVOCs. The analysis requested by the INEEL was for the UHC list of semi-volatiles and the laboratory's results covered 76 different SVOCs. Because the analyses were performed, the results are briefly discussed in this document. Results for the tank residual samples indicated very few detections, which are summarized as follows:

- Acetophenone was detected in all 14 tank samples (but not in the baseline) at concentrations ranging from 0.52 to 9.2 $\mu g/L$;
- Diethylphthalate was detected in 4 tank samples at concentrations ranging from 1.2 to 5.4 $\mu g/L$;
- Di-n-butylphthalate was detected in 2 tank samples, both at a concentration of 1.2 $\mu g/L$;
- Dimethylphthalate was detected in 1 tank sample at a concentration of 0.59 $\mu g/L$; and
- Bis(2-ethylhexyl)phthalate was detected in 1 tank sample at a concentration of 1.4 ug/L.

These positive detections were all reported by the laboratory with "J" flags as being estimated values above the MDL, but below the RQL. There were no other SVOCs detected in any of the samples and none were reported as detected in the baseline sample.

According to information posted by EPA (2004b), acetophenone is a common ingredient in fragrance used in soap and perfumes, and is used as a flavoring agent in food and as a solvent for plastics and resins. Because of its use in fragrances, it is possible that this constituent may have been introduced in the laboratory. The only sample without an acetophonone detection was the baseline sample, which was analyzed on a different day than the other samples. In any case, it is believed that the small concentrations reported for acetophenone should not be considered an issue for this closure action. The only other

SVOCs identified in any of the samples are phthalates, which are considered to be common laboratory contaminants. Though the L&V Report (EVAC 2004c) did not report these constituents as being in blanks and, therefore, was not able to discount these detections, it is believed that their presence in the tank samples is sufficiently suspect that they also should not be considered an issue for the closure action.

It should also be noted that the L&V effort rejected (i.e., "R" flagged) results for acid fraction SVOCs (i.e., the phenol compounds) in two of the samples because of poor recovery of acid-fraction surrogates. In each case, the rejected results had been reported as "not detected" by the laboratory. The two samples with rejected data were from different tanks, so in both cases, the second sample from the tank provided good data that acid fraction compounds were not present in the tank residuals.

3.1.4 Anions in the SSA Purge Water Storage Tanks

The L&V Report (EVAC 2004d) covering the analyses of anions in the decontamination water samples from the SSA tanks indicates the analyses were performed in accordance with EPA method 300.0 and assigned only limited qualifiers to the results. Positive detections of chloride and sulfate (applicable to all of the reported results) were assigned "J" flags and the "not detected" results for nitrates were assigned "UJ" flags. The L&V effort also assigned a "J" flag to the single reported detection of nitrate, which was for the baseline sample. The other flags shown with the anion results in the tables are those assigned by the laboratory to indicate the constituent was not detected ("U" flags) or that the constituent was reported at a value above the detection limit, but below the reporting limit ("J" flagged). The qualifications assigned to the chloride, sulfate, and nitrate results are discussed further in the paragraphs that follow.

- *Chloride and Sulfate.* Chloride and sulfate are discussed together because both were qualified as a result of associated matrix spike recoveries reported by the laboratory being above the normally accepted range of 90 to 110%. The L&V Report did not identify the specific recovery values, but did indicate that both were below 150%. The results of the matrix spike analyses indicate there could be a high bias in the results reported for these two constituents. Since neither have associated toxicity values and no action levels are shown in Tables 6, 7, and 8, the qualifications placed on the results have no impact on whether closure performance standards were achieved. Also, as indicated previously, it is common for "J" and "UJ" flagged data to be used in environmental evaluations.

- *Nitrate.* Results for nitrate were also qualified by the L&V effort as a result of the associated matrix spike recovery reported by the laboratory being outside of the normally accepted range of 90 to 110%. In this case, the recovery was below the lower control limit. Again, the L&V Report did not identify the specific recovery value, but did indicate that it was above 60%. The results of the matrix spike analyses indicate there could be a low bias in the results reported for nitrate, which were reported as "not detected" for each of the tank residual samples. The L&V Report also noted that the baseline sample was run at a different time than the tank samples and with some other sample group. As a result, the matrix spike data associated with the tank samples did not apply to the baseline sample and the matrix spike samples run at the time the baseline sample was analyzed were performed with the matrix representative of another group of samples. The "J" flagged that was assigned to the nitrate results for the baseline sample (the only positive detection reported for nitrate) was based on the reviewer's judgment. In any case, nitrate does not have a recognized toxicity value and, as a result, no action level, so the qualifications placed on the results have no impact on whether closure performance standards were achieved.

It can be concluded from the anion results shown in Tables 6, 7, and 8, that the only anion action level (that for fluoride) was not exceeded by any of the reported results. The highest fluoride value reported (354 μg/L) is basically three orders of magnitude below the action level (344,000μg/L). The only anions analyzed and not included in the result tables are bromide and ortho-phosphate (as P). Bromide was not detected in any of the samples and ortho-phosphate was detected in only one sample and this single detection was at a concentration below the identified reporting level (so it was "J" flagged by the laboratory). Since there was no detection reported in the second sample from the same tank, even this single detection is questionable.

3.2 EVALUATION OF FIELD OBSERVATIONS

Observations made by the independent PE of closure activities for the SSA Purge Water Storage Tanks, as described in Section 2.1, were intended to provide verification that tank conditions and locations were as identified in the Closure Plan and that actions specified in the Closure Plan were, in fact, performed. The PE was able to visually verify that the SSA Purge Water Storage Tanks were as described in the Closure Plan. They were lined up within the SSA as described and all appeared to be in good condition. Because of the height of the tanks and the safety qualification requirements associated with the equipment used to access their tops, the PE could not personally verify how much liquid remained in the tanks. However, observations made by the sampling crew and relayed to the PE as well as the behavior of the sampling equipment, were consistent with there being only a few inches of water left in the tanks for sampling purposes. It was also noted during the field observations that tank SSA #6 was labeled as being empty. Closure actions observed by the independent PE on June 8 and 9, 2004 provided verification that samples were collected from each of the SSA Purge Water Storage Tanks. The PE observed no notable discrepancies between the sampling actions and those described in the Closure Plan and its associated SAP.

3.3 EVALUATION OF RECORD REVIEWS

Records reviewed by the independent PE as a means providing additional verification of closure activities fit into four general categories (tank decontamination, sampling documentation, action level development, and waste management records), which are discussed in this section. Conversations and correspondence, if any, that provided additional information are included in the discussions.

3.3.1 Tank Decontamination Records

Section 4.1.2 of the Closure Plan requires that each of the SSA Purge Water Storage Tanks be decontaminated with a high-pressure water wash using a minimum of 200 gallons of water and that this wash cycle be performed twice. The independent PE did not observe the tank decontamination activities, but did review a log of the activities and asked questions of INEEL individuals involved in the actions. As summarized in Table 4 in Section 2.2.1, the logs provided adequate detail on the decontamination actions to show that the Closure Plan criteria were met. Conversation with the individual that performed the high-pressure wash provided verification that the interiors of the tanks were washed in the manner described in the Closure Plan. It is also the PE's opinion that results from the samples collected of the tank residuals after decontamination are the ultimate verification that the decontamination was adequate.

3.3.2 Sample Records

Section 4.1.2 of the Closure Plan specifies that collection of samples from the storage tanks was to be done in accordance with a field sampling plan. The SAP provided to the independent PE provided verification that a sampling plan was developed and the field observations made during the sampling event provided verification that the plan was followed. The Sampling Logbook (described in Section 2.2.2.2) was reviewed by the PE primarily to verify that the rinse blank described in the SAP, which was not witnessed during the observed field activities, was collected and to understand how it was collected. The Sampling Logbook entries provided the necessary information.

It was noted during review of the SAP that collection of the rinse blank (or baseline sample) was to be done immediately before sampling the first tank. As described in Section 2.2.2.2, the Sampling Logbook indicates this sample was collected the week before the tank residuals were sampled. Though this appears to be a deviation from the SAP, it might be reasoned that collection of the baseline sample at the time the tanks were decontaminated was the most appropriate time for this activity. The baseline sample collected in this manner was representative of the source water that went into the tanks at the time of their decontamination. An attempt to collect the baseline sample a week later would likely have resulted in a sample of questionable value in representing that water source, particularly with regard to duplicating the condition or status of the water truck. In spite of the wording in the SAP, the independent PE agrees with the timing of the baseline sample collection.

The L&V Reports reviewed by the PE fulfilled SAP requirements on their own, in addition to providing the information discussed and referenced previously in this document. The L&V Reports provided verification that the independent validation requirements specified in Sections 4.3.2 of the SAP were met.

3.3.3 Action Level Development

The action level development document (INEEL 2004c) described in Section 2.2.3 represents the INEEL's approach for meeting the CERCLA risk assessment requirement identified in Section 4.1.2 of the Closure Plan. Once the action levels were developed, as briefly described in Section 2.2.3, the development document then calculates and sums the risk and hazard quotients that would result from occupational/worker exposure to tank residuals, at those action level concentrations, were they released to the soil. The total risk values presented in the document under this scenario are summarized in Table 9.

It can be seen from the information in Table 9 that, at the action levels, the threat posed by the tank residuals are clearly within the criteria set in Section 4.1.2 of the Closure Plan of a risk of less than 10^{-4} and a hazard quotient of less than 1. Since all COCs detected in the tank residual samples were well below

Table 9. Summary of cancer risk and hazard quotient posed by tank residuals at action levels. [a]

Description of risk and exposure scenario	Risk Quantification
Cancer Risk	
Excess cancer risk for an occupational soil ingestion scenario	6.06E-07
Excess cancer risk for an occupational soil inhalation scenario	5.00E-10
Total excess cancer risk	6.06E-07
Non-Cancer Risk (Hazard Quotient)	
Hazard quotient for an occupational soil ingestion scenario	3.42E-02
Hazard quotient for an occupational soil inhalation scenario	3.74E-05
Total hazard quotient	3.42E-02

a. Source: INEEL 2004c

their action levels, it can be concluded that the risk actually posed by contaminants in the tank residuals are well below those shown in Table 9 and the criteria set in the Closure Plan have been met.

It should be noted that the text of the Closure Plan (Section 4.1.2) states, "A CERCLA risk assessment will be calculated, using the results from the field sampling." As described in the preceding text, this is not precisely the methodology used by the INEEL. Rather hypothetical action levels were calculated for the COCs and demonstrated to be compliant with the Closure Plan criteria. That is, the risk assessment described by the Closure Plan was only performed on the action level values not the measured values resulting from the field sampling. This is further discussed in Section 4 as a deviation from the Closure Plan. The independent PE believes this is not a significant deviation and that it did not adversely affect achievement of closure performance standards.

3.3.4 Waste Management Records

Section 4.2 of the Closure Plan specifies that closure-generated waste will be managed as CERCLA remediation waste in accordance with the SSA Waste Management Plan. The waste management documentation reviewed and conversations with INEEL personnel (as described in Section 2.2.4) provided verification that the purge water from the tanks and the subsequent decontamination rinsate water were properly managed as was the waste debris generated during sampling activities. These waste were shown to be consistent with CERCLA waste streams that are considered "on-going." The closure-generated wastes clearly fit within the WDDFs reviewed and the disposition proposed in those forms (i.e., the ICDF evaporation pond for the liquids and the ICDF landfill for the sampling debris) appears appropriate for CERCLA remediation waste.

4. DEVIATIONS FROM CLOSURE PLAN

One minor situation was observed during the certification effort where the closure implementation action appeared to differ from that described in the Closure Plan. This difference, or deviation, was not considered significant with respect to the SSA Purge Water Storage Tank closure meeting the intent of the Closure Plan, but as a matter of completeness, is described in the paragraph that follows.

- Section 4.1.2 of the Closure Plan states, "A CERCLA risk assessment will be calculated, using the results from the field sampling. The performance levels to be achieved will be a risk less than 10^{-4} and hazard quotient of less than 1 for a worker scenario." The methodology used by the INEEL did not involve a risk assessment calculation using the results of the field sampling. However, the methodology used was able to clearly demonstrate the performance levels set in the Closure Plan were achieved by the results of the field sampling. As described in this document, the INEEL methodology involved the development of action levels for the COCs identified in the Closure Plan. These action levels were then shown to achieve the performance levels through a CERCLA risk calculation. When the results of the field sampling were shown to be below actions levels, it was a simple conclusion that the performance levels were achieved. The INEEL methodology deviated from the Closure Plan only in that it did not generate a set of risk assessment numbers specific for the tank residues. It is the independent PE's opinion that this is not a significant deviation and that it did not adversely affect achievement of closure performance standards.

5. CONCLUSION

It is the conclusion of this certification effort that the closure activities observed, or otherwise evaluated, have met the intent of the Closure Plan for the SSA Purge Water Storage Tanks and that these units, representing partial closure of the SSA, have achieved the appropriate clean closure requirements. The key closure activities required to meet performance standards, as described in Section 1.2 of this document, have been completed as summarized in the statements that follow.

- The wastewater was removed from the tanks to the extent practicable and the inside of the tanks were decontaminated using a high-pressure water spray. The decontamination, or washing, began at the top of the vessel and work down the sides, and was performed twice, each using more than the minimum 200 gallons of raw water. The mixed wash water and residual wastewater were pumped to a portable container after each of the washing cycles with enough left in the tank after the second cycle to allow for sampling. The removed water was sent for proper disposition to a lined evaporation pond on the INEEL, designated for CERCLA waste.

- Decontamination residues remaining in the tanks after the two wash cycles and removal actions were sampled and the samples were analyzed for the COCs (as shown in Table 1 of this document) identified in the Closure Plan.

- A CERCLA risk assessment methodology was used to calculate the action levels for the COCs that would meet the clean closure performance levels set by the Closure Plan of a risk of less than 10^{-4} and a hazard quotient of less than 1 for a work exposure scenario. The results from the sampling and analysis of the decontamination residues indicated that all detected COCs were below the action levels and, therefore, that the performance levels were met.

- All waste generated under this closure action was appropriately managed as CERCLA remediation waste.

6. REFERENCES

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